2003-49778
(H102 2839)

[Title of the Document] Specification

[Title of the Invention]

HYDRAULIC SHOCK ABSORBER WITH SUB-CYLINDER

[Claims for the Patent]

[Claim 1]

A hydraulic shock absorber with a sub-cylinder having a cylinder for generating a damping force by sliding of a built-in piston, and a sub-cylinder having a gas chamber non-coaxially to said cylinder, to be connected through a crooked oil path from said cylinder, characterized in that

a diameter of said oil path is larger than a distance with a tip portion of an inner wall of said cylinder at the maximum stroke of said piston.

[Claim 2]

The hydraulic shock absorber with a sub-cylinder according to Claim 1, characterized in that the diameter of said oil path is substantially the same as an inner diameter of said cylinder.

[Claim 3]

The hydraulic shock absorber with a sub-cylinder according to Claim 1, characterized in that said oil path is provided with a bulkhead for partitioning the gas chamber off and this bulkhead is provided with drawing means.

[Claim 4]

The hydraulic shock absorber with a sub-cylinder according to Claim 1, characterized in that each axis of said cylinder and said sub-cylinder is made parallel.

[Detailed Description of the Invention]

[0001]

[Field of the Invention]

The present invention relates to a hydraulic shock absorber with a sub-cylinder to be used for a suspension device or the like of a motorcycle.

[0002]

[Prior Art]

As such an absorber, there is a hydraulic shock absorber with a sub-cylinder having a cylinder which is a hydraulic cylinder for generating a damping force, and a sub-cylinder to be connected through a crooked oil path from this cylinder, in which there is provided a gas chamber within the sub-cylinder (See Patent Literature 1).

[0003]

[Patent Literature 1] Japanese Patent Publication No. 61-7393

[0004]

[Problems to be Solved by the Invention]

In a case where an oil path is provided and is connected to a sub-cylinder as in the case of the above-described conventional example, when a cylinder contracts at high speed, hydraulic fluid flows through the oil path, and a high reaction force is stored in a gas chamber of the sub-cylinder while when the cylinder is changed into expansion, restoration of the gas chamber causes the hydraulic fluid which has flowed into the sub-cylinder to return to the cylinder. At this time, since the diameter of the oil path is small, a flow velocity of the hydraulic fluid becomes high, and therefore, there occurs an unexpected damping force. Since, however, such a damping force

is not necessary for the intrinsic shock absorber, it is requested to prevent such a damping force from occurring. It is an object of the present application invention to realize the request.

[0005]

[Means for Solving the Problems]

In order to solve the above-described problem, according to the invention of Claim 1 concerning a hydraulic shock absorber with a sub-cylinder of the present application, there is provided a hydraulic shock absorber with a sub-cylinder having a cylinder for generating a damping force by sliding of a built-in piston, and a sub-cylinder having a gas chamber non-coaxially to the cylinder, to be connected through a crooked oil path from the cylinder, characterized in that a diameter of the oil path is larger than a distance with a tip portion of an inner wall of the cylinder at the maximum stroke of the piston.

[0006]

According to the invention of Claim 2, there is provided a hydraulic shock absorber with a sub-cylinder described in the above-described Claim 1, characterized in that a diameter of the oil path is substantially the same as an inner diameter of the cylinder.

[0007]

According to the invention of Claim 3, there is provided a hydraulic shock absorber with a sub-cylinder described in the above-described Claim 1, characterized in that the oil path is provided with a bulkhead for partitioning the gas chamber off, and this bulkhead is provided with drawing means.

[0008]

According to the invention of Claim 4, there is provided a hydraulic shock absorber with a sub-cylinder described in the above-described Claim 1, characterized in that each axis of the cylinder and the sub-cylinder is made parallel.

[0009]

[Advantages of the Invention]

According to Claim 1, since a diameter of the oil path is larger than a distance with a tip portion of an inner wall of the cylinder at the maximum stroke of the piston, capacity of the hydraulic fluid can be secured even in the vicinity of the maximum stroke, the flow velocity thereof can be rendered uniform, and the damping force is stabilized. Also, since an axis of the cylinder has been made non-coaxial to that of the sub-cylinder, the sub-cylinder is to be arranged at an angle with respect to the cylinder, and even if the sub-cylinder is placed side by side with the cylinder, the overall length can be managed to become nearly the same length as the cylinder to make it compact.

[0010]

According to Claim 2, since the diameter of the oil path is substantially the same as that of the cylinder, the hydraulic fluid which passes through the oil path hardly generates any unexpected damping force. Also, sufficient capacity of the hydraulic fluid can be secured.

[0011]

According to Claim 3, since the bulkhead has been provided with drawing means, it is possible to properly adjust the hydraulic pressure against pressure to be applied by the gas

chamber by adjusting the damping force even if the diameter of the oil path is large.

[0012]

According to Claim 4, since each axis of the cylinder and the sub-cylinder has been made parallel, their respective machining axes coincide with each other and machining becomes easier.

[0013]

[Embodiments of the Invention]

Hereinafter, with reference to the drawings, the description will be made of one embodiment. Fig. 1 is a side view showing a motorcycle according to the present embodiment; Fig. 2 is a side view showing a rear suspension portion; Fig. 3 is a plan view showing the rear suspension portion; and Fig. 4 is an overall cross-sectional view showing a rear cushion.

[0014]

In Fig. 1, a reference numeral 1 designates a front wheel; 2, a front fork; 3, a head pipe; 4, a handlebar; and 5, a main frame. The main frame 5 is shaped like a longitudinal square cylinder, made of light alloy, and branches off into left and right parts from the head pipe to extend obliquely downward toward the rear.

[0015]

Below the main frame 5, there is supported a series four-cylinder engine 6. There are two supporting points: a coupling point 7 between the intermediate portion of the main frame 5 and the upper portion of the cylinder; and a coupling point 9 between the rear end of the main frame 5 and the upper

portion of the a mission case 8 for constituting the engine 6 at rear end.

[0016]

Air is sucked at downdraft into an intake port 10 of the engine 6 from an air cleaner 11 supported by the main frame 5. A reference numeral 12 designates an injector. The air cleaner 11 is accommodated within a recess formed on the side of a base of the front portion of a fuel tank 13.

[0017]

An exhaust pipe 16 extends forward from an exhaust port 15, runs below the engine 6 to extend toward the rear, and is connected to a pair of left and right mufflers 17. The left and right mufflers 17 are disposed on both sides of the rear wheel 18. A reference numeral 19 designates a radiator arranged in front of the engine 6.

[0018]

A pair of left and right seat rails 20 are provided obliquely upward toward the rear from the rear end portion of the main frame 5, and with the periphery thereof enclosed, there is provided a rear cowl 21, on top of which there is provided a seat 22.

[0019]

In the intermediate portion in the up-and-down direction of the mission case 8 at the rear end, the front end portion of the rear swing arm 24 is supported by the pivot shaft 23 in such a manner as to be freely rock-able in the up-and-down direction. At the rear end of the rear swing arm 24, there is supported the rear wheel 18.

[0020]

A reference numeral 25 designates a rear cushion; 26, a step bracket; 27, an output sprocket; 28, a chain; and 29, a driven sprocket. Further, a portion from the front surface of the vehicle body to both left and right side surfaces is covered with a front cowl 30.

[0021]

A case composed of a crankcase 31 of the engine 6, the mission case 8 and the like is divided into upper and lower parts, and the pivot shaft 23 is somewhat downward deviated from this slit surface 32.

[0022]

As shown in Figs. 2 and 3, the rear swing arm 24 has a pair of left and right arm portions 33, their upper portions at the front end are coupled together through a first cross member 34 and a second cross member 35. The first cross member 34 and the second cross member 35 are provided with an interval in the back-and-forth direction, the first cross member 34 is shaped like a pipe, a supporting portion at both ends thereof is a protruded portion 36 for protruding upward, provided on the upper surface of the left and right rear swing arms 24 at the front ends.

[0023]

A tip end portion 33a of an arm portion 33 in which the protruded portion 36 is formed is a portion for bearing-supporting the pivot shaft 23, and is formed together with the protruded portion 36 by casting or the like through the use of an appropriate material such as light alloy.

[0024]

The second cross member 35 is a cross member made integral with the left and right arm portions 33 with each other respectively by welding or the like. Between these first cross member 34 and second cross member 35, there are provided a pair of left and right cushion brackets 37 which extend in parallel in the back-and-forth direction with an interval from side to side. The cushion bracket 37 extends in the back-and-forth direction beyond the upper end portion 38 of the rear cushion 25, and the front and rear end portions thereof are welded to the upper surfaces of the first cross member 34 and the second cross member 35 respectively.

[0025]

As is apparent from Fig. 3, there is formed substantially rectangular space 39 when observed from its plan, enclosed with the first cross member 34, the second cross member 35 and the left and right cushion brackets 37, there is located an upper portion 38 in the space, and further, a subsidiary cylinder 40 passes through this space 39 to rise obliquely upward from the upper portion 38 for extending toward the rear.

[0026]

A shoulder bolt 41 which traverses each intermediate portion of the left and right cushion brackets 37 penetrates from one (left side in the figure) to the other (right side in the figure), and is fastened to a nut 42 provided on the other side, whereby the upper portion 38 is supported. At this time, the left and right portions of the upper portion 38 are supported by a boss 37a for protruding inwards, which has been

formed at the central portion of the cushion bracket 37. For this reason, the support rigidity becomes further higher.

[0027]

The pivot shaft 23 is located in the neighborhood of the first cross member 34 when observed from its plan, and at both left and right ends thereof, there are provided a pair of external auxiliary plates 43. At the rear ends of the left and right external auxiliary plates 43, there are installed a step bracket 26 (See Fig. 2) respectively.

[0028]

In the external auxiliary plate 43, there is provided a long boss 44 in the back-and-forth direction, a split surface 45 is formed in the intermediate portion thereof, whereby a bolt 46 is fastened from behind the boss 44 to thereby fasten and fix the pivot shaft 23. A reference numeral 47 in Fig. 3 designates a bolt for fastening the upper and lower split portions of the mission case 8 from above.

[0029]

As shown in Fig. 2, a rear cushion 25 has a damper 50 and a cushion spring 51, and the upper and lower portions of the cushion spring 51 are supported by retainers 52, 53 provided on the upper and lower outer periphery of the damper 50 respectively.

[0030]

A joint metal 54 of the damper 50 for operating a piston which cannot be seen in the figures extends below the damper 50, and the lower end thereof is coupled to one apex portion 56 of a first link 55 which forms a substantially triangle shape.

A lower end 54a of the joint metal 54 is shaped like a fork to sandwich the apex portion 56 therebetween, and the apex portion 56 is coupled by fixing with a bolt and a nut. An apex on the other end side 57 is axially installed to a stay 58 which extends from the lower portion of the mission case 8 at the rear end.

[0031]

To an in-between apex portion 59 of the first link 55, there is coupled one end of a linear link arm 60, and the other end is coupled to a link pivot 61. The link pivot 61 is provided at a convex portion 62 for protruding downward from the lower end of the second cross member 35.

[0032]

Fig. 4 is an overall cross-sectional view showing a rear cushion 25. A damper 50 of the rear cushion 25 has a cylinder 63 and a sub-cylinder 40 to be connected through an upper portion 38 which is shaped like a cap.

[0033]

The cylinder 63 has a piston 64 therein, and generates a damping force by sliding the piston 64 within the cylinder 63. The piston 64 extends a piston rod 54 toward one end side in the axial direction, has an end plate 65 at its end portion, and there is provided bump rubber 66 there. A tip of the piston rod 54 which protrudes outward from the end plate 65 is a fork-shaped mounting portion 54a.

[0034]

At the outer peripheral portion of the end plate 65, the position of a retainer 53 is adapted to be adjusted by an adjuster 67. The adjuster 67 rotates at multi-stages in the peripheral

direction to thereby change the position of the retainer 53 in the axial direction. Between the retainer 53 and a spring seat 68 provided at a retainer 52 on the upper portion side, which is a shoulder portion of the upper portion 38, there is provided a cushion spring 51, which is adapted to generate a reaction force when contracting.

[0035]

The upper portion 38 is installed to one end portion of the cylinder 63 by means of a thread portion 69, its tip portion in the axial direction constitutes an upper end portion 38, in which there is provided an installation hole 70 for passing a bolt 41 through.

[0036]

Between the installation hole 70 and the seat 68, there is provided an installation area 71 protruding obliquely sideway at an angle in a substantially 45° direction, in which the sub-cylinder 40 is fitted. Inside the installation area 71, there is formed an oil path 72, the diameter R2 of which is nearly the same as the diameter R1 of the cylinder 63.

[0037]

Between the oil path 72 and the sub-cylinder 40, there is provided a bulkhead 73, at the central portion of which there is provided a drawing path 74, and when hydraulic fluid flows between the oil path 72 and within the sub-cylinder 40, the damping force is adapted to be generated.

[0038]

Within the sub-cylinder 40, there is provided a gas chamber 76 enclosed with an elastic film 75, and the gas chamber 76

is filled with high-pressure gas. Outside the gas chamber 76, there is provided a liquid chamber 77 which communicates to the oil path 72 through the drawing path 74. An opening of the elastic film 75 is blocked by means of a sealing member 78 tightly fitted in one end of the sub-cylinder 40. At the center of the sealing member 78, there is provided an adjusting valve 79.

[0039]

An axis C1 of the cylinder 63 and an axis C2 of the sub-cylinder 40 constitute non-coaxial relationship at an angle of substantially 45°, the diameter R2 of the oil path 72 can be freely set within a range to the extent that any damping force due to flow of the hydraulic fluid within the oil path 72 is not generated. In this case, the occurrence of no damping force is that there is not generated a high damping force to the extent that the damping performance of the rear cushion 25 is significantly affected in a practical area.

[0040]

Also, an imaginary line 64A in Fig. 4 shows a normal stroke limit of the piston 64, and 64B shows a stroke limit position at the time of permanent set in fatigue of a bump rubber 66. R2 is assumed to be larger than a distance D between the position of this 64B and an end portion 66 of the cylinder 63 in the axial direction. If R2 is smaller than this, the oil path 72 will be likely to generate a damping force for affecting the performance.

[0041]

Next, an operation of the present embodiment will be described. Since the diameter R2 of the oil path 72 is larger

than the distance D with the tip portion 80 of an inner wall of the cylinder 63 in 64B at the maximum stroke of the piston 64, the capacity of the hydraulic fluid can be secured even in the vicinity of the maximum stroke, the flow velocity thereof can be rendered uniform, and the damping force is stabilized.

[0042]

Also, since an axis C1 of the cylinder 63 has been made non-coaxial to an axis C2 of the sub-cylinder 40, the sub-cylinder 40 is to be arranged at an angle with the respect to the cylinder 63, and even if the sub-cylinder 40 is placed side by side with the cylinder 63, the overall length can be managed to become nearly the same length as the cylinder 63 to make it compact.

[0043]

Further, since the diameter R2 of the oil path 72 is substantially the same as the diameter R1 of the cylinder 63, the hydraulic fluid which passes through the oil path 72 hardly generates an unexpected damping force. Also, sufficient capacity of the hydraulic fluid can be secured.

[0044]

Also, since the bulkhead 73 has been provided with a drawing path 74 as drawing means, it is possible to properly adjust the hydraulic pressure against pressure to be applied by the gas chamber 76 by adjusting the damping force even if the diameter of the oil path 72 is as large as R2. However, the drawing means is not limited to the drawing path 74, but may be a throttle valve. In addition, since the sub-cylinder 40 passes through space 39 to rise obliquely upward from the upper portion 38 and extend toward the rear, it is possible to install the sub

cylinder 40 in the most excellent space in the space layout, and there is little possibility of interfering with other parts.

[0045]

In this respect, the present application invention is not limited to the above-described embodiment, but it is possible to change and apply in various ways, and for example, as coaxial arrangement of the cylinder 63 and the sub-cylinder 40, it may be possible to arrange not only obliquely, but also in parallel through the upper portion 38. In this case, the sub-cylinder 40 may be placed side by side with the cylinder 63 as shown in Fig. 5. Also, as shown in Fig. 6, it may be possible to invert contrary to Fig. 5. In this respect, since it is all the same as in Fig. 4 with the exception of the arrangement of the sub-cylinder 40, common portions are designated with common reference numerals, and description of other portions will be omitted. By doing so, the cylinder 63 and the sub-cylinder 40 become coaxial to each other, and since the machining shafts coincide with each other, the machining performance will be improved.

[Brief Description of the Drawings]

Fig. 1 is a side view showing a motorcycle according to the present embodiment;

Fig. 2 is a side view showing a rear suspension portion;

Fig. 3 is a plan view showing the rear suspension portion;

Fig. 4 is an overall cross-sectional view showing a rear cushion.

Fig. 5 is an overall cross-sectional view of another example in which the arrangement of the sub-cylinder has been

changed; and

Fig. 6 is an overall cross-sectional view of further another example in which the arrangement of the sub-cylinder has been changed.

[Description of Symbols]

16: Exhaust pipe, 25: Rear cushion, 38: Upper end portion, 40: Sub-cylinder, 50: Damper, 51: Cushion spring, 72: Oil path, 73: Bulkhead, 74: Drawing path, 76: Gas chamber.

[Title of the Document] Abstract

[Abstract]

[Object]

When the rear cushion 25 is provided with the cylinder and the sub-cylinder, and these are connected through an oil path, since there may occur an unexpected damping force because the oil path is narrow, the damping force will be prevented.

[Constitution]

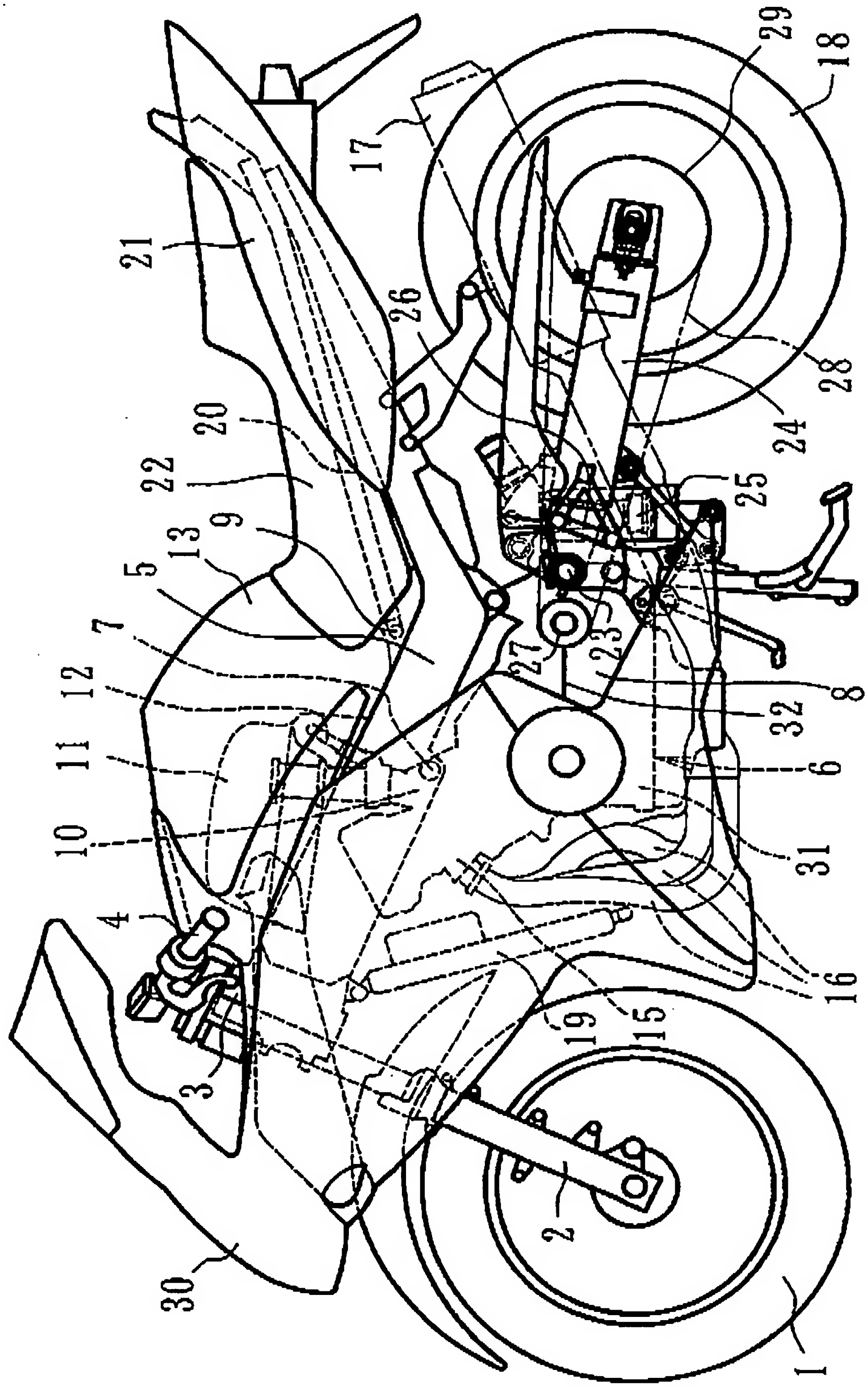
The damper 50 of the rear cushion 25 is provided with the cylinder 63 and the sub-cylinder 40, and these are coupled at the upper portions 38. The cylinder 63 and the sub-cylinder 40 are non-coaxial, and inside the upper portion 38, there is formed the oil path 72. The diameter R1 of the cylinder 63 and the diameter R2 of the oil path 72 are nearly the same, and occurrence of a damping force within the oil path 72 will be prevented. Inside the upper portion 38, there is provided the bulkhead 73 between the oil path 72 and the sub-cylinder 40, and there is provided the drawing path 74 there. Within the sub-cylinder 40, there is provided the gas chamber 76, and hydraulic fluid is caused to flow within the oil path 72 and the sub-cylinder 40 through the elastic film 75.

[Selected Drawing] Fig. 4

【書類名】 図面

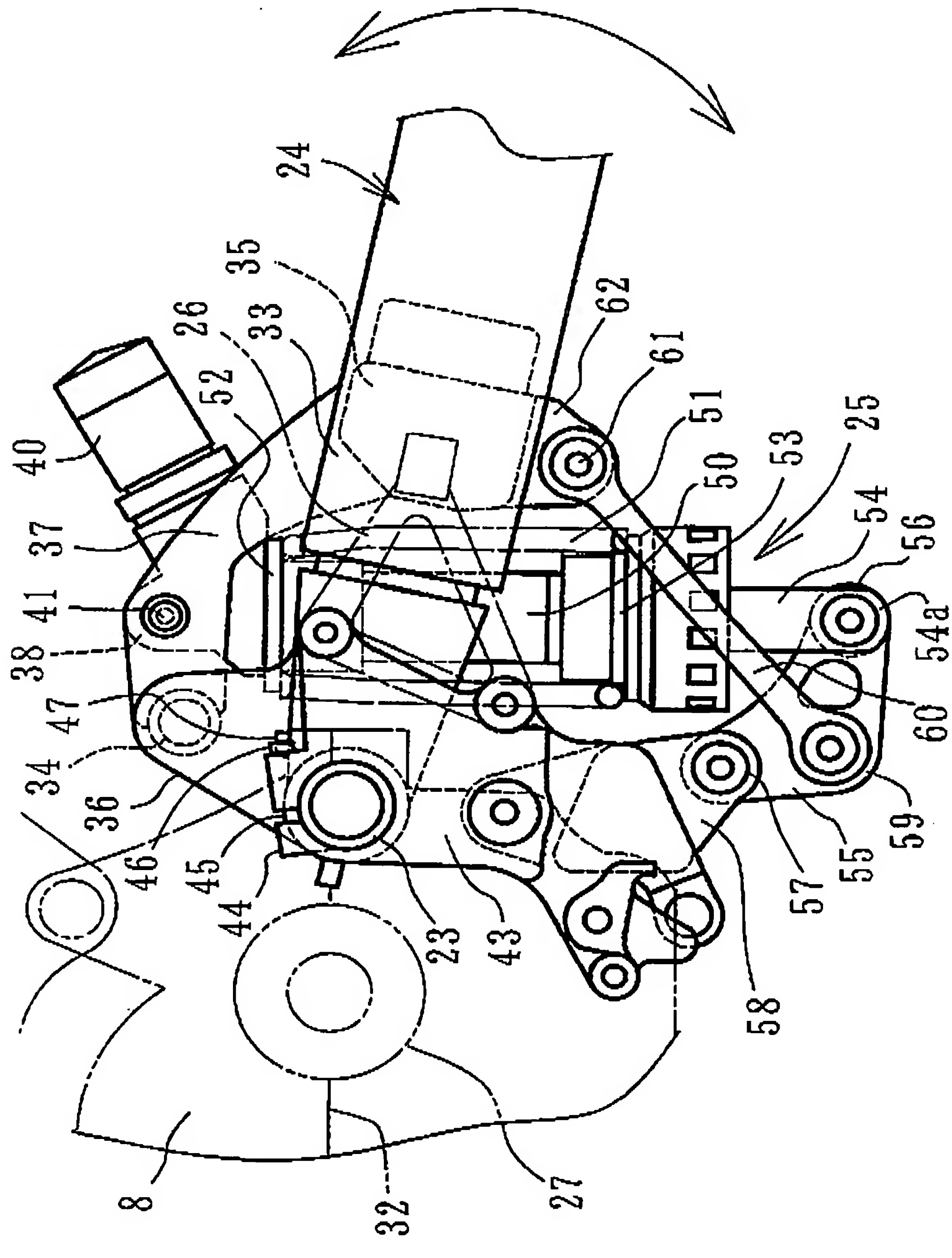
【図１】

Fig. 1



【図２】

Fig. 2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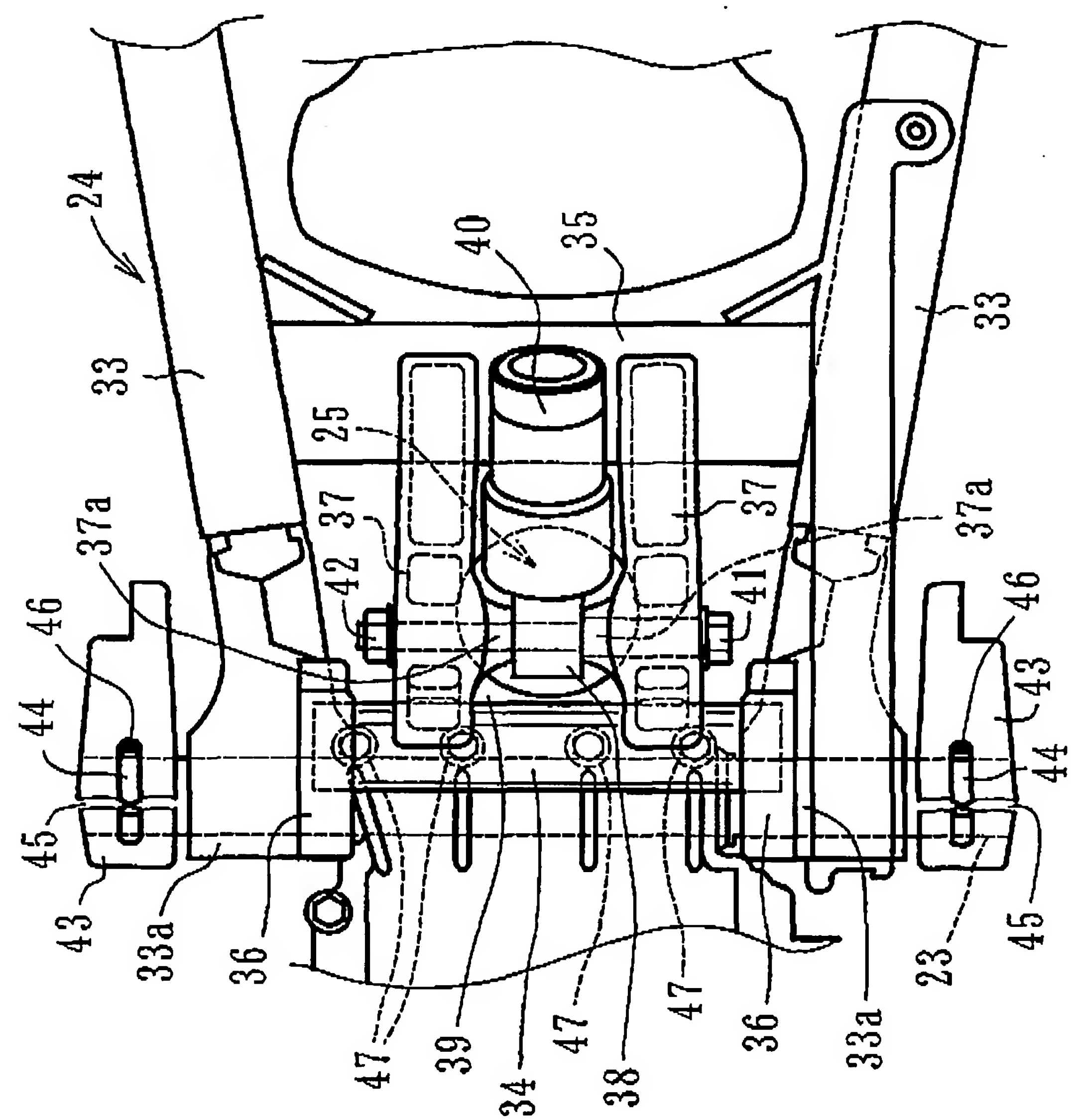
【図３】

Fig. 3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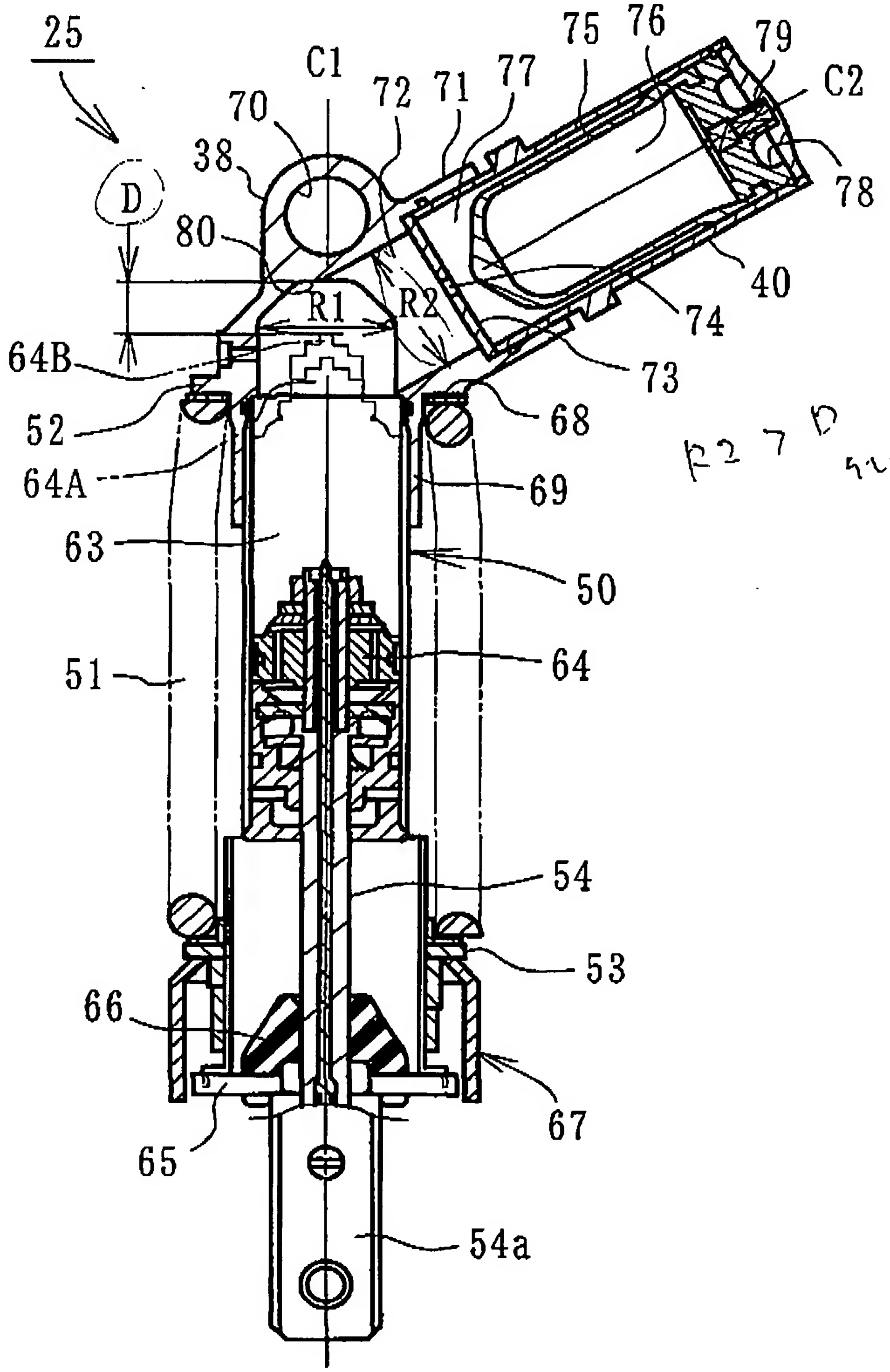
【図４】
Fig. 4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C2
78
38
D
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R1
R2
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52
68
64A
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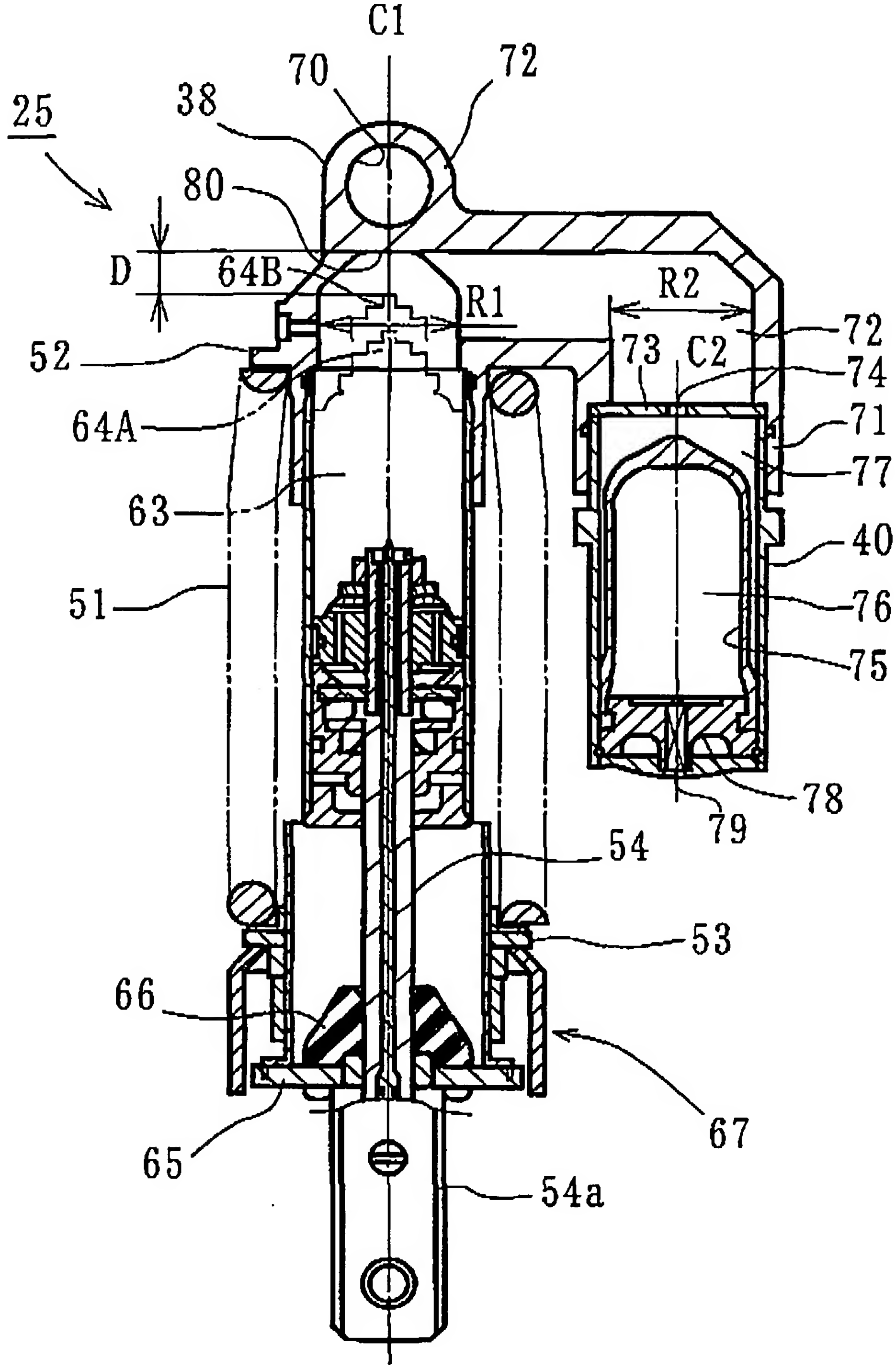
63
50
64
51
54
53
66
67
65
54a

R2 7 D

【図５】

Fig. 5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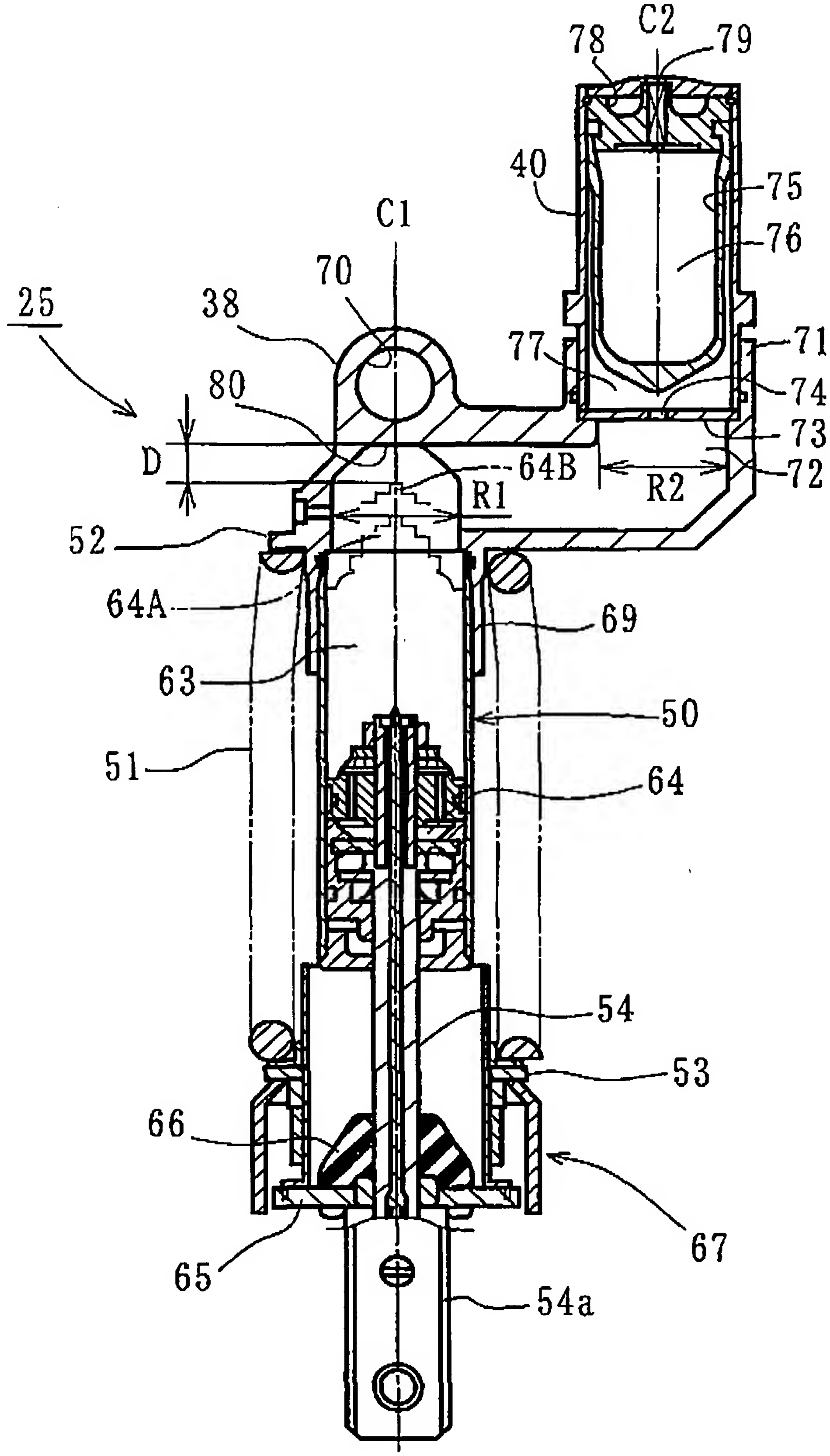
54a

【図６】
Fig. 6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